Air Quality Impacts of the Stone's Throw Landfill in Tallassee, Alabama: A Pilot Study

Practicum in Climate Change, Sustainability, and Public Health

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Executive Summary

In this pilot study, we investigated health and air quality impacts of the Stone's Throw Landfill on the Ashurst Bar/Smith Community in Tallassee, Alabama through monitoring ambient (outdoor) air quality and collecting information on the health and perceptions of residents. The study took place between March 12th and March 23rd, 2018 and was conducted by graduate students as a part of a practicum course in Climate Change, Sustainability, and Public Health at the Yale School of Public Health and in collaboration with the Environmental Justice Clinic of Yale Law School and Ashurst Bar/Smith community members, as well as with input from the Department of Graduate Public Health at Tuskegee University. The pilot study was intended to inform the formation of a research agenda to evaluate air quality and other impacts of the landfill on the Ashurst Bar/Smith Community.

Air Monitoring

We aimed to provide a preliminary assessment of outdoor ambient air quality through monitoring at six locations within a 1.5-mile radius of the landfill. We focused on common landfill emissions that are known to cause human health problems, including hydrogen sulfide (H_2S), total non-methane volatile organic compounds (NMVOCs), particulate matter (PM) size less than 2.5 micrometers ($PM_{2.5}$), and asbestos. We also conducted truck traffic counts and monitored ambient noise levels as these variables are known to impact quality of life. Daily weather conditions including wind direction and speed were also recorded.

H_2S levels ranged from 0 to 5 ppb, with average values over periods of one to six hours ranging from 0 to 3.3 ppb. The highest level of 5 ppb is slightly below the lower limit for olfactory

effects of 8 ppb.[1] Warmer temperatures and higher humidity conditions may increase H_2S levels and we suggest monitoring in the summer months and when smells are particularly potent. NMVOC levels ranged from 0 to 4336 ppb, with average values over periods of one to six hours ranging from 0 to 2601 ppb. For comparison, in 2013, the national annual average NMVOC concentration across Canada was 8.5 ppb (measured as toluene equivalents).[2] The United States does not have federal NMVOC standards. However, under the German guideline for schools, long-term NMVOC concentrations should not exceed 220 ppb.[3] Future studies should consider monitoring for longer periods and for specific NMVOCs, with a focus on hazardous air pollutants (HAPs; e.g., benzene, vinyl chloride) and NMVOCs that are specifically associated with landfills.

$PM_{2.5}$ concentrations ranged from 0 to 58.5 $\mu g/m^3$, with average concentrations ranging from 3.2 to 14.5 ug/m^3. Although the highest average concentration (over a period of 6 hours) did not exceed the World Health Organization or U.S. Environmental Protection Agency 24-hour limits, we note that because negative health impacts from $PM_{2.5}$ have been observed even at the lowest levels of exposure, the levels observed in the Ashurst Bar/Smith community are a cause for concern.[4] Future studies should monitor for PM2.5 for longer periods (at least 24 hours).

Finally, we monitored for asbestos particles because the landfill accepts friable and non-friable asbestos. Our monitoring was limited to one day at one location and revealed no significant amount of asbestos in the air. We suggest conducting frequent monitoring for asbestos particles because even short-term exposure can cause a type of cancer called mesothelioma decades later.

Noise and traffic

We monitored noise in one-or two-hour increments. The highest maximum noise levels (all daytime) ranged from 76.5 dBA to 98.1 dBA. The lowest and highest time-weighted average noise levels were 35.2dBA and 57.3 dBA. We were unable to find a community noise standard for the state of Alabama or for Alabama municipalities, so we used the Connecticut Noise Standard to provide context. If Connecticut's noise standards were applied to Tallassee, Stone's Throw Landfill would be in violation, with each daytime maximum noise level greater than the guideline of 61 dBA. Further daytime monitoring is recommended. In addition, nighttime monitoring is recommended to determine whether the Connecticut night time limit of 51dBA is exceeded.

Many community members expressed concerns associated with trucks, including their speed, noise, frequency, and damage to the road due to the ongoing traffic. The highest hourly vehicle count we observed was 48 (including 23, 18-wheeled semi-trucks).

Health survey

We designed and conducted a community health survey to assess the health impacts of the landfill on the community and the perceptions of the community of the landfill. A total of 74 surveys were completed and returned by community members. Most respondents were very concerned or extremely concerned about issues relating to the landfill, including smell, noise, traffic, air pollution, health impacts, property values, animals, and litter. Twenty-nine percent of respondents reported being told by a doctor that they have asthma and 21% reported being told

by a doctor that they have chronic obstructive pulmonary disease. For both conditions, these figures were almost double the statewide prevalence in Alabama.

Recommendations and next steps

The research presented in this pilot study is highly preliminary and limited. However, this initial research identified some key warning signs, including hydrogen sulfide levels approaching the odor threshold, high non-methane volatile organic compound (NMVOC) levels of unknown composition, transient elevated $PM_{2.5}$ levels, high noise levels in relation to community standards, high prevalence rates of asthma and COPD, and, importantly, high levels of concern in the community about landfill impacts. We suggest prioritizing future planning and public and private research through collaborative partnerships with the Yale School of Public Health, the Department of Graduate Public Health at Tuskegee University, and Ashurst Bar/Smith community members, using a community-based participatory research approach if favored by the community. Furthermore, we suggest that the community consider seeking support form ADEM, the landfill, the City of Tallassee, or the county, for monitoring efforts.

Further air monitoring for H_2S, NMVOCs, $PM_{2.5}$, and asbestos is clearly indicated. In general, we suggest that air quality monitoring should be performed for longer periods of time at various locations both daily and annually because air quality can change dramatically according to time of day, day of week (weekdays versus weekends), season, landfill activity, and weather conditions. In addition, it is particularly important to monitor at locations downwind of the landfill, which was difficult to do with our limited amount of time.

For community members that are interested in continuing air pollution monitoring to gather more data, we see the greatest opportunities in monitoring particulate matter and noise, due to the low cost and technical accessibility of the monitoring devices: Purple Air Monitor for $PM_{2.5}$ (approximately $250) and the NIOSH Noise App (available free for download on iPhones). Also feasible would be truck traffic counts by community members to provide additional information on the impacts of the landfill on quality of life and health, as well as provide data on the potential correlation between truck traffic and emissions.

In addition to air monitoring, testing of water and soil samples for possible pollution from landfill runoff is indicated. Initial soil test is already being planned or carried out by Tuskegee University researchers. Monitoring of indoor air quality should be considered as well.

The elevated prevalence of asthma and COPD, although based on a relatively small sample size, are of obvious concern. The main limitation of our community health survey was its relatively small sample size. We recommend collecting more health surveys from the community to increase the sample size and develop more robust data on the health impacts of the landfill.
We recommend that the community consider requesting the following:

1) that the Alabama Department of Environmental Management (ADEM) and/or the Stone's Throw Landfill publicly release emissions history data as well as information about landfill contents;
2) that the landfill or government agencies provide resources for offsite air, soil, dust, and water monitoring;
3) that the City of Tallassee implement a community noise ordinance for Tallassee;

4) that ADEM improve enforcement of landfill permit terms, such as enforcement of hours of operation and ensuring adequate cover of any open face of the landfill;
5) that ADEM implement more stringent landfill policies including i) requiring that any open face of the landfill be covered at night; ii) withdrawal of the current permit variance that allows the landfill to have two simultaneous open faces; and iii) requirement that the landfill clean up trash from the sides of the road, particularly along Washington Boulevard;
6) that the Alabama Department of Transportation (ALDOT) or local traffic authorities improve traffic safety (e.g., traffic lights, lower speed limits, speed bumps, restricted hours for trucks, a dedicated private road for landfill truck traffic);
7) that ALDOT provide resources for community-based traffic monitoring efforts that could document adverse impacts of truck traffic;
8) that ADEM increase buffers and/or restrict any future expansion of size of the landfill; and
9) that the Alabama Department of Public Health ensure access to comprehensive health care for all community members.

I. Introduction

This pilot project aimed to provide a preliminary baseline assessment of ambient air quality and community health in the Ashurst Bar/Smith community, which is located adjacent to the Stone's Throw Landfill in Tallassee, Alabama, as well as to assess priorities for future study. To identify potential adverse health impacts, we (1) conducted a literature review of landfill emissions and associated health effects, (2) examined the emissions history of Stone's Throw Landfill and the historical context of the surrounding Ashurst Bar/Smith Community, and (3) monitored ambient air quality for human health and environmental pollutants, monitored noise and truck traffic, and (4) conducted a community health survey. The air monitoring and health survey took place between March 12th and March 23rd, 2018 and was conducted by graduate students as a part of a practicum course in Climate Change, Sustainability, and Public Health at the Yale School of Public Health and in collaboration with the Environmental Justice Clinic of Yale Law School and Ashurst Bar/Smith community members, as well as with input from the Department of Graduate Public Health at Tuskegee University.

II. Literature Review of Landfill Emissions and Associated Health Effects

We conducted a literature review of the likely air pollutants and emissions that are associated with municipal solid waste (MSW) landfills that primarily receive household waste, but also receive other types of non-hazardous waste such as commercial waste, industrial waste, construction and demolition debris, and sludge from wastewater treatment plants.

We identified the following priority emissions for monitoring, based on the threat they pose to human health and the likelihood of elevated concentrations near the landfill: hydrogen sulfide (H_2S), non-methane volatile organic compounds (NMVOCs), particulate matter (PM) associated with transport and handling of waste, and asbestos.

In the literature review below, we present reference levels of various landfill emission types to be used in analyzing our data later in the report. It should be noted that for some gases we present reference levels for direct landfill gas emissions — as opposed to ambient air near a landfill — which is not a representation of the type of monitoring that we performed or of the levels of emissions that will likely be reaching communities. However, we included these levels because they were more accessible from the literature than ambient air levels and can offer an upper limit for ambient air levels, since landfill gas diffuses into ambient air.

Hydrogen Sulfide

H_2S, the main odorous component in landfill gas, is produced from the decomposition or biodegradation of waste through the activity of sulfur-reducing bacteria. The generation of H_2S is impacted by temperature, moisture content, pH levels, and waste composition and volume, with the highest levels detected in the summer months.[5] Concentrations of H_2S in ambient air are typically less than 1 ppb, with concentrations from natural sources ranging from 0.11 to 0.33 ppb.[1,6] On the other hand, H_2S concentrations in ambient air near landfills has been shown to be undetectable to greater than 100 ppb.[5] Heaney et al. conducted a study of a municipal solid waste regional landfill in North Carolina, performing continuous air monitoring of ambient air at the

community boundary near the landfill during January-February and September-November 2009. They reported a range of 0 to 15 ppb with 15-minute average concentrations of 0.22 ± 0.52 ppb.[8]

The human health impacts of H_2S (Table 1) depend on exposure duration, frequency, and concentration. Exposure from 8 to 200 ppb produces olfactory effects, while 20,000 to 50,000 ppb produces eye irritation, 50,000 to 150,000 ppb produces respiratory irritation and severe eye damage, and 250,000 ppb and above produces risk of death.[1] Sociological studies have shown that odors can cause extreme annoyance and emotional disturbances, as well as a decrease in property values and economic disadvantages.[9] In the Heaney et al. study mentioned previously, 23 participants kept twice-daily diaries for 14 days about odor intensity, changes to daily activities, moods, and other physical symptoms. Odor was strongly associated with alterations of daily activities, mood states, mucosal irritation, and upper respiratory symptoms, suggesting "air pollutants from a regional landfill negatively impact the health and quality of life of neighbors."[8]

Table 1: Health effects of H_2S at different exposure levels[1]

Exposure (ppb)	Health Effects
8-200	Olfactory threshold
20,000	Sense of smell to gas lost
20,000-50,000	Eye Irritation
50,000	Prolonged exposure may cause pharyngitis and bronchitis
60,000	Prolonged exposure may cause conjunctivitis and eye pain
150,000	Irritation of upper respiratory tract
250,000	Pulmonary edema with risk of death
500,000	Very dangerous
1,000,000	Loss of consciousness
1,000,000-2,000,000	Immediate collapse with paralysis of respiration

Non-Methane Volatile Organic Compounds

Typically, landfill gas contains trace amounts (less than 1%) of Non-Methane Volatile Organic Compounds (NMVOCs).[10] We focus on NMVOCs because methane, although a VOC and a potent greenhouse gas, is not directly harmful to human health. Many NMVOCs, such as benzene, chloroform, toluene, vinyl chloride, and others, are classified as hazardous air pollutants (HAPs), and regulated by the EPA under the Clean Air Act.[11] Most of the NMVOC emissions from landfills result from the volatilization of organic compounds contained in the landfilled waste and from biological processes and chemical reactions within the landfill.[10] The Clean Air Act's regulatory default for all NMVOC concentrations in landfill gas is 4,000 ppm. The EPA's *Compilation of Air Pollutant Emission Factors (AP-42)* reports a default

concentration of 595 ppm of NMVOC landfill gas for municipal solid waste in cases where there is no or unknown co-disposal of hazardous waste.[10] The general public is not directly exposed to landfill gas, which allows for these relatively high regulatory defaults. There are no standards for NMVOC concentrations in ambient air, to which the general public is exposed. If there were such standards, we speculate that they would be substantially lower than the regulatory default for landfill gas.

NMVOCs react with nitrogen oxides and sunlight to form ground-level ozone.[12] People with asthma, and children and older adults, are the most at risk for the adverse health effects of ozone. Short-term exposure to ozone can cause muscles in the airways to constrict, leading to wheezing and shortness of breath; it can also increase the frequency of asthma attacks, lung infection, and cause chronic obstructive pulmonary disease. Long-term exposure to ozone also may increase the risk of death from respiratory causes, but the evidence is not as strong as the evidence for short-term exposure.[13]

The EPA's *Air Emissions from Municipal Solid Waste Landfills – Background Information for Proposed Standards and Guidelines* shows a summary of NMVOCs found in landfill gas.[14] The most frequently detected compounds are trichloroethene, benzene, and vinyl chloride with average concentrations of 3800 ppb, 3520 ppb, and 7040 ppb, respectively.[14] Table 2 shows a summary of health effects associated with certain NMVOC MSW landfill emissions components, occupational exposure thresholds for health risks, and average concentrations reported by USEPA.[14] Table 3 shows guidelines for indoor total NMVOC levels in school

buildings produced by the German Federal Environment Agency's Indoor Air Hygiene Commission.[3] We are unaware of guidelines for outdoor NMVOC levels.

Table 2: Health effects associated with selected NMVOCs emitted from MSW landfills.[14]

NMVOC	Health Effects	TLV-TWA (ppb)*	TLV-STEL (ppb)**	Average Concentration in Landfill Gas (ppb)
Benzene	Leukemia, aplastic anemia, multiple myeloma, cytogenic changes	10,031	170,210	3,520
Carbon tetrachloride	Damage to liver, lung, kidney, central nervous system, possible embryotoxicity	4,922	10,002	1,490
Chloroform	Damage to liver, lung, kidney, central nervous system, probable carcinogen	10,026	-	60
Ethylene dichloride	Damage to central nervous system, probable carcinogen	5,041	19,913	143,000
Methylene chloride	Probable carcinogen	49,868	-	20,000
Trichloroethylene	Probable carcinogen	50,016	99, 845	3,800
Vinyl chloride	Central nervous system effects; brain, liver and lung cancer; possible teratogen -- human carcinogen	5,086	-	7,040

*TLV-TWA: (threshold limit value, time weighted average) is the time-weighted average concentration for a normal 8 hrs workday and a 40 hrs work week, which all workers are exposed day after day, without adverse health effects.

**TLV-STEL (threshold limit value, short-term exposure limit) is the time-weighted average concentration to which workers can be exposed continuously for a short period of time (no longer than 15 min and no more than four times per day) without suffering from irritation, chronic or irreversible tissue damage or narcosis of sufficient degree to increase accidental injury or reduce work efficiency, and provided that the daily TLV-TWA is not exceeded.

Table 3: German guidelines for indoor total NMVOC levels in school buildings[3]

Level	Total NMVOCs (ppb)	Hygienic rating	Exposure limit
1	0-65	Insignificant., provided that individual NMVOC limits are not exceeded. Below 65 ppb is the target value, or goal.	No limit
2	65-220	Still hygienically insignificant, provided that individual NMVOC limits are not exceeded. However, points to need for more ventilation.	No limit
3	220-660	Abnormal. A level of 220 ppb should not be exceeded in the long term. An assessment of individual NMVOC levels is recommended.	12 months
4	660-2200	Hygienically significant. An assessment of individual NMVOC levels should be conducted	1 month
5	2200-5500	Hygienically unacceptable. At levels >5500 ppb, the space should not be used at all.	<1 hour/day

Particulate Matter

Particulate matter (PM) is a complex mixture of solid and liquid particles of various sizes that become suspended in the air.[15] The chemical composition of these airborne particles can vary, but typically include organic matter, acids (nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens.[15] According to the World Health Organization (WHO), PM affects humans more than any other pollutant. PM enters the human body largely through the respiratory tract[15] and smaller particles may enter the bloodstream.[15] Health conditions associated with PM inhalation include irritation of the eyes, nose and throat, decreased lung function, coughing, phlegm, chest tightness, shortness of breath, acute bronchitis, aggravated asthma, irregular heartbeat, nonfatal heart attacks, strokes, lung cancer, and premature death.[15] The severity of health consequences as a result of exposure depend largely on the duration, concentration, size, and chemical composition of the particles[16] but there is a demonstrated dose-

response relationship between exposure and morbidity and mortality, both daily and over time.[16] However, it is important to note that there is no safe level of PM for humans, and negative health impacts have been observed even at the lowest levels of PM exposure.[15]

$PM_{2.5}$ is particulate matter 2.5 micrometers or less in diameter, whereas PM_{10} is particulate matter 10 micrometers or less in diameter. Table 4 shows the U.S. EPA and WHO guideline limits for $PM_{2.5}$ and PM_{10}.

Table 4: $PM_{2.5}$ and PM_{10} 24-hour and annual exposure limits listed by the U.S. Environmental Protection Agency (EPA)[17] and the World Health Organization (WHO)[4]

	$PM_{2.5}$ (µg/m³)		**PM_{10} (µg/m³)**	
	24-hour	Annual	24-hour	Annual
EPA	35	12	150	N/A
WHO	25	10	50	20

Landfills have been shown to emit significant levels of PM.[18] This is likely tied to the various day-to-day activities involved with maintaining a landfill including the operation of diesel-powered vehicles, the movement of these vehicles on unpaved dirt roads, the act of tipping waste into the landfill, waste compaction, and the operation of methane torches.[19] PM_{10} has been measured at levels as high as 4,597 µg/m³ at a landfill site in Crete, Greece.[19]

Asbestos

Stone's Throw Landfill accepts friable and non-friable asbestos.[20] Friable asbestos is material that contains more than 1% asbestos and can be pulverized to powder by the pressure of a human hand, whereas non-friable asbestos is material that contains more than 1% asbestos but cannot be

pulverized to powder by a human hand. Chronic inhalation exposure to asbestos can lead to a lung disease called asbestosis. Symptoms include shortness of breath, difficulty in breathing, and coughing. Asbestosis is a progressive disease meaning the severity of symptoms tends to increase with time, even after the exposure has stopped. Furthermore, because even short-term exposure to asbestos can cause a type of cancer called mesothelioma decades later. Additional health problems include lung cancer, pleural disease, pulmonary hypertension, and immunological effects. A person who has been exposed to asbestos should visit a medical professional. After exposure has occurred, asbestos cannot be removed from the lungs, but preventative measures can take place including having regular health exams, quitting smoking, and getting regular vaccinations against flu and pneumococcal pneumonia.[21]

Summary of Epidemiological Studies

The potential health risk to populations living near landfills is an issue of ongoing public health concern.[22] While there have been some scientific studies that indicate a link between living in close proximity to a landfill site and adverse health effects, overall, the scientific literature on the health effects of landfills is inconclusive or, at best, "suggestive."[23] Particularly with respect to cancer and mortality rates, many review articles state that there is inadequate or insufficient evidence linking landfills with health effects.[24,25,26] A 2007 WHO Report describes the scientific evidence of the health effects of landfills, based on several recent reviews, and reports that there is lack of consistency, a high level of confounding factors, and poor data on exposure information.[27] Similarly, a review by Vrijheid 2000 found that the "increases in risk of adverse health effects (low birth weight, birth defects and certain types of cancers) and an increased prevalence of self–reported health symptoms, such as fatigue, sleepiness and headaches, have been reported near both individual landfill sites and in some multi-site studies, although risks to health from landfill sites were hard to quantify because of lack of direct exposure measurement and of the role of confounding factors and suggested more interdisciplinary research to improve levels of knowledge on risks to human health of waste disposal in landfill sites."[28]

III. Overview of the Stone's Throw Landfill and Ashurst Bar/Smith Community

Stone's Throw Landfill, located in Tallassee, Alabama, is classified as a municipal solid waste landfill by the State of Alabama, Department of Environmental Management (ADEM). The landfill was purchased and re-opened by the current owners, Advanced Disposal, in 2002. The most recent permit was granted to Advanced Disposal by ADEM in December 2016[29] and the

next permit renewal date is January 31, 2022. The landfill is currently permitted to process up to 1,500 tons of waste daily, including asbestos and sewage, and claims to have the capacity to continue accepting waste through 2053. ADEM is primarily responsible for overseeing monitoring, as well as regulating federal and state laws within the landfill.

The total permitted area for the Stone's Throw Landfill is approximately 175 acres with 125 acres permitted for MSW disposal operations and 5.8 acres permitted for construction and demolition disposal operations.[29] The facility is permitted to accept wastes from all counties in Alabama, and Harris, Muscogee, and Troup counties in Georgia, generating a high volume of truck traffic through residential areas of Tallassee, which has caused community concern related to speed limits, road conditions (e.g., potholes), noise, and safety.

Community Demographics, Protests, and Concerns

Stone's Throw Landfill is located in the historic African American Ashurst Bar/Smith neighborhood of Tallassee. This neighborhood is not only historic because of its age, but also because of its origins. Following the Civil War and abolition of slavery, newly freed enslaved people were able, through the Freedman's Bureau, to purchase land and settle in this community. The original landowners then passed their land to their heirs, maintaining the community over the generations.

According to 2010 census data, 1,649 people live within a 3-mile radius of the landfill, comprised of 612 households. Of those, 52% are African-American (52%) and 68.5% are low income.[30] Within a 1-mile radius of the landfill, the population is approximately 117 people of

which 71% are African-American[31] and 99% are low income.[32] However, residents of the Ashurst Bar/Smith Community (which is most directly adjacent to the landfill) suggest that these figures underestimate the proportion of black residents in the neighborhood, because census block groups are far larger than the Ashurst Bar/Smith Community. Based on local knowledge, it is estimated that the community living closest to the landfill is approximately 98% black (Figure 1).[33]

According to the United States Environmental Protection Agency's EJSCREEN tool, the community living within 1 mile of the Stone's Throw Landfill is above the 75th percentile nationally for a number of environmental justice variables (Figure 2).[32]

Ex. 6 Personal Privacy (PP)

Figure 1: Property map of Tallassee and the Ashurst Bar/Smith Community depicting land ownership in the community. Pink boxes are property lots owned by African Americans. Blue boxes are property lots owned by non-African Americans. White boxes were not considered in the making of this map. The orange blocks are owned by Advanced Disposal and the red lines diagonal lines signify property recently acquired by Advanced Disposal. Map dated February 2018.

EJSCREEN Report (Version 2017)
1 mile Ring Centered at 32.515204,-85.830992
ALABAMA, EPA Region 4
Approximate Population: 117
Input Area (sq. miles): 3.14

Selected Variables	Percentile in State	Percentile in EPA Region	Percentile in USA
EJ Indexes			
EJ Index for Particulate Matter (PM 2.5)	86	82	82
EJ Index for Ozone	87	79	80
EJ Index for NATA* Diesel PM	76	68	68
EJ Index for NATA* Air Toxics Cancer Risk	85	82	84
EJ Index for NATA* Respiratory Hazard Index	84	81	81
EJ Index for Traffic Proximity and Volume	68	63	64
EJ Index for Lead Paint Indicator	90	90	85
EJ Index for Superfund Proximity	80	74	71
EJ Index for RMP Proximity	81	72	72
EJ Index for Hazardous Waste Proximity	75	67	67
EJ Index for Wastewater Discharge Indicator	97	98	96

Figure 2: EJSCREEN Report for 1-mile radius around Stone's Throw Landfill. Accessed 4/26/2018. NATA: National Air Toxics Assessment; RMP: Risk Management Plan[32]

The Ashurst Bar/ Smith Community Organization joined a Title VI complaint against ADEM in 1999 filed by the Center for Race, Poverty, and the Environment claiming that ADEM engaged in a pattern and practice of discrimination by approving the siting of landfills in African American communities. In 2003, the Ashurst Bar/Smith Community Organization filed a complaint with the Environmental Protection Agency under Title VI of the Civil Rights Act. The complaint asserted that ADEM violated the civil rights of the community by permitting the landfill due to the unjustified, disparate negative impact of the landfill on African-Americans. The 2003 complaint remained open at EPA until 2017, when the Ashurst Bar/Smith Community Organization and four other communities across the country sued EPA for failing to investigate in a timely way.[34] On April 2, 2018, a federal court ruled that EPA violated the law by waiting a decade or more to investigate civil rights complaints within the time frame mandated by the law. The court's decision came in response to the lawsuit litigated by Earthjustice and Yale Law School's Environmental Justice Clinic. The lawsuit challenged EPA's failure to protect civil

rights in an environmental context. (See Appendix I for a full timeline of the Ashurst Bar/Smith Community Organization activities related to the landfill).

Residents of the Ashurst Bar/Smith Community have reported health concerns including asthma and other respiratory problems, nosebleeds, vomiting, and skin problems in children, as well as breast, colon, kidney, and prostate cancers, asthma and other respiratory problems, memory problems, sleep apnea, and diabetes in adults. Community members also have expressed concerns related to safety and traffic, quality of life, property rights and values, and the ability to grow food.[35]

Stone Throw's Landfill Site History and Overview

Site History

A landfill has existed on the site, intermittently through a variety of owners and operators, since 1980, with expansion of the landfill beginning in 1991 through an agreement between Tallapoosa County and Tallassee Waste Disposal Center. Shortly thereafter, community members began to formally voice concerns about the landfill.

Composition and Sources of Waste

The following waste is approved for disposal at Stone's Throw Landfill: municipal solid waste, construction and demolition debris, yard waste, inert waste, sludge, wastewater biosolids, friable and non-friable asbestos, industrial waste, foundry sand, ash, and contaminated soil (cite Stone's Throw Landfill website).[20] In addition, other special waste approved by ADEM may also be accepted.[29] The proposed daily maximum volume to be received at the landfill is listed as 1,500 tons in the Municipal Solid Waste permit approved by ADEM in September 2016. The facility

accepts wastes from all counties in Alabama, and Harris, Muscogee, and Troup counties in Georgia. The landfill accepts waste from Advanced Disposal subsidiaries and multiple third-party haulers.[29]

Emissions History

A detailed, though often incomplete, report of emissions from the landfill is listed in the Enforcement and Compliance History Online (ECHO) system for the public, run by the EPA and a summary is provided below (Table 5).[30]According to the current permit, in addition to the pollutants listed below, the landfill is required to monitor the following potential pollutants on a monthly basis: cadmium, chemical oxygen demand, chromium, copper, oil & grease, pH, rainfall, solids (settleable, total dissolved, total suspended) and turbidity.[36,37] It is important to note that monitoring near-surface gases, like those common in landfills, are not useful in determining impacts on the health of nearby residents but the information can be used to indicate if high levels of the gases are escaping from the landfill.[9]

Table 5: Pollutant emission data from ECHO for Stone's Throw Landfill in Tallassee, Alabama. Data is recorded by Stone's Throw Landfill under the authority of ADEM. $MTCO_2e$ is the amount of methane emissions equivalent to one metric ton of carbon dioxide emissions and a common way to record greenhouse gas emissions.

Pollutant	2008 Emissions	2011 Emissions	2014 Emissions
Hazardous air pollutants (HAPs (lbs)	12,512	2,481	15,424
NMVOCs (lbs)	496,800	4,620	10,440
Methane ($MTCO_{2e}$)	N/A	71,946	112,289
PM_{10} (lbs)	1,599,040	43,626	64,104
$PM_{2.5}$ (lbs)	446,280	13,826	16,444

Summary of Emissions by Pollutant

Hydrogen Sulfide

We found no public record of H_2S emissions in our search of EPA and Alabama databases. We included H_2S in our monitoring plan as it is a commonly known pollutant from landfills and has the potential for negative impacts on human health and quality of life.[1] It is possible that the landfill reports H_2S data to ADEM, but that it is not released publicly. Future studies could inquire whether data on H_2S emissions could be made available for analysis.

Non-Methane Volatile Organic Compounds

NMVOC emissions have decreased significantly at the Stone's Throw Landfill from 496,800 pounds in 2008 to 10,440 pounds in 2014 (Table 5). The cause of the decrease is likely advances in gas capturing technology and more restrictive environmental regulations.

Particulate Matter

From 2008 to 2011 the data shows a significant decrease in both $PM_{2.5}$ and PM_{10}, likely due to greater restrictions on emissions and better management practices. From 2011 to 2014 there was an increase in PM, likely because the landfill expanded in size.

Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are known to cause serious health effects including cancer and birth defects as well as adverse environmental effects. A complete list of EPA regulated HAPs can be found at epa.gov/haps; some of the most common HAPs are benzene, which is found in gasoline and is also an NMVOC, and metals including cadmium, mercury, and lead. The data show an increase of 3,000 pounds of HAP emissions at Stone's Throw Landfill between 2008 (12,512 pounds) and 2014 (15,424 pounds).

Methane

Decomposing waste in landfills releases methane. A previous report by Glen B. Smith of Environmental Consulting and Engineering to ADEM on the status of methane emissions from the Stone's Throw Landfill in October 2002 says "Following analysis of the data and field observations from the sampling event, it appears that the areas which have a tendency to hold water and remain saturated, have resulted in an increased production of methane gas from

moisture. . . . the reduction of moisture introduced into the soils should also reduce the amount of methane produced in the area." However, it appears that methane production has actually been increasing (Table 5), perhaps because the landfill is continuously expanding in size.

Compliance and Violations

According to the Integrated Compliance Information System, a federally run compliance program, the air facility status of the landfill is "operating major emissions." The landfill is obligated to abide by state and federal regulations under ADEM. Advanced Disposal claims that it attempts to reduce releasing of pollutants by implementing new technologies, and that it has "never had a Notice of Violation (NOV) since opening."

In 2015, the landfill received two violation warning letters, one for storm water construction and the other for not reporting information.[38] Stone's Throw Landfill has had a number of minor violations filed including a recent violation on February 9th, 2018; however, information is not currently available about the nature of the violation. Reports of violations are available through ADEM. Additional information can be found on the EPA ECHO website, under the "Three Year Compliance By Quarter" section.[30] Federal and state databases do not contain any records of current violations of federal or state regulations by the landfill. Although monitoring in this pilot study focuses on air emissions, it is worth noting that recently, the landfill has been named as a defendant in a number of nuisance suits, including *Tarver v. Advanced Disposal Services South, LLC, et al.*, CV-2017-900076 (Amended Complaint filed Circuit Court, Macon County, AL, July 27, 2018),[39] which alleged that the landfill illegally discharged excess leachate and hazardous

chemicals and compounds into the Tallassee Wastewater Treatment system and into the Tallapoosa River, causing harm to downstream community residents.

IV. Methodology

This project was approved by the Yale University Institutional Review Board as an exempt project.

Ambient Air Monitoring

Based on the community's health concerns, our literature review of landfill emissions, our examination of the emissions history of the Stone's Throw Landfill, and recommendations from air monitoring experts, we chose to focus our air monitoring on several chemical compounds: H_2S, total NMVOCs, $PM_{2.5}$, and asbestos. To assess noise from the landfill trucks and traffic flow, we recorded noise levels using a phone app and conducted counts of landfill trucks.

To monitor for the chemical compounds, we employed several air sensor devices, including the Jerome 631-X (for H_2S), the PID ppbRAE 3000 (for total NMVOCs), and the Purple Air (for $PM_{2.5}$). The Purple Air monitor is a newly developed, user friendly air monitor that uses two lasers to detect a range of PM sizes. The accuracy of the monitor is much higher for $PM_{2.5}$ than for PM_{10}; we therefore only present results for $PM_{2.5}$. Asbestos air concentrations were measured using a pump to draw air through a filter and examining the filter under a microscope to estimate the number of asbestos fibers on the filter. We used a Kestrel Weather Monitor to provide meteorological context to this sampling.

We monitored the air at six separate locations (Figure 3; Table 6), all within 1.5 miles of the landfill, over a total of five days between March 12th and March 23rd, 2018. At each location we measured weather conditions including wind speed and direction, temperature, humidity, and cloud cover (a table displaying all collected weather data is in Appendix II). A small number of community volunteers offered to allow us to monitor on their private properties. Among these locations, we prioritized properties by distance from the landfill and availability of the property owners while we monitored.

Figure 3: A map of the region in which air sampling occurred. Three monitoring sites were located in the northeast quadrant and three were in the southwest quadrant. Exact locations have been omitted from the map in order to protect the privacy of landowners.

Table 6: Geographic description of each sampling location

Location	Distance from center of landfill (mi)	Direction from landfill	Along major truck route (Y/N)	Special Features
A	1.24	SW	Y	Landfill not visible but can hear in the background.
B	0.48	SW	Y	Portions of the landfill are visible, can hear clearly.
C	0.87	NE	N	Property borders landfill. Trees are present but do not block view completely. Can hear landfill operations in background.
D	0.77	NE	Y	On a hill, elevation higher than landfill. Site of landfill blocked by trees, visibility is low. Can hear landfill operations distantly in the background, truck noise very present.
E	0.32	NE	Y	100% visibility and noise exposure to landfill.
F	0.58	SW	Y	Landfill not visible, but can hear in background.

We chose to do a majority of the sampling at one location (Location D) because the landowner was particularly receptive to our monitoring on the property and the location is less than 0.25 miles from the entrance of the landfill. During monitoring, an active landfill cell— that faced the road on which the property was located — was open. It is important to note that although the entrance of the landfill is within 0.25 miles of the front porch of Location D, this property is located on a hill with trees in the direct path to the landfill. Although the landfill cannot be seen from the property, constant noises like the beeping when a truck is backing up, as well as smells, are detectable from it. This location was also particularly useful for monitoring noise and truck

traffic because it is located on the road on which landfill trucks travel to get from Interstate 85 to the landfill.

The Kestrel Weather Monitor revealed similar trends across all of the monitoring periods. Overall, the rain that fell the week before the team arrived in Tallassee may have caused a decrease in the amount of PM we were able to sense with the Purple Air Monitors. Further, windy conditions may have decreased the amount of pollutants detected when monitoring locations were not downwind from the landfill.

The NIOSH noise app[40] was used to monitor noise levels at Location D and Location B, which are located on roads with the most truck traffic. Open-top garbage truck traffic counts were also conducted at Location D.

Our original sampling plan included monitoring air quality for long consecutive periods of time; however, we were unable to monitor in the very early morning and late into the evening. It was difficult to monitor during these hours because of poor weather and our desire to respect the landowners' privacy. In addition, we were unable to capture weekend days due to poor weather and travel conflicts. Finally, we note that it is likely that our presence became known in this small community fairly quickly and may even have been made known to the landfill in advance of our arrival. It is possible that landfill practices might have been modified by our presence and monitoring activities.

Community Health Survey

In addition to conducting air monitoring at various locations in close proximity to the Stone's Throw landfill, we developed a questionnaire for the purpose of collecting information about the health of the community as well as measuring the perceptions among community members about the landfill. Questions included on the community health survey were informed by a literature review of questionnaires conducted to collect similar information and a review of preliminary open-ended surveys collected in the Ashurst Bar-Smith neighborhood of Tallassee by Earthjustice and the NAACP Legal Defense Fund in March 2016. Participants in our survey were asked to answer questions about their health, perception of the landfill and its impact on the community, and demographics, in addition to questions about incidence of asthma among children that live in their household. In total, the final community health survey was comprised of 35 multiple choice and short answer questions (see Appendix IV).

When designing the community health survey, special attention was paid to the protection of identifiable information. As a result of the recruitment of men from this community to the US Public Health study on syphilis in Tuskegee and the historical mistreatment of the community by academic institutions, our research design considered that community members might be understandably distrustful of the collection of personal information. In order to protect the confidentiality of all survey participants, addresses were the only identifiable information that was collected over the course of this study. This information was used to establish distance and direction of the participant's residence in relation to the landfill. This information was located on the first page of the survey. Per this study's IRB protocol, following the completion of the survey the participant was assigned a participant ID number. The first page of the survey was then

detached from the remainder of the survey responses and stored separately. This method ensured that even if lost or stolen, the survey responses could not be linked to the respondents. Addresses will be destroyed after the distance and direction information has been incorporated into the database.

Persons were eligible to participate in the community health survey if they were over the age of 18 and provided verbal consent. We did not collect written consent as this would have qualified as identifying information. In order to ensure that children were not counted twice by surveys filled out by adults that live in the same residence, we cross checked all addresses for duplicates.

Community health surveys were administered either verbally by a trained community member or member of the research team or self-administered on paper. Surveys were completed and collected at a community meeting held on March 10th at the New Zion AME Zion Church in Tallassee and at a gathering held by the pastor of the church on March 12th. Additionally, our team collected surveys door-to-door and at the Wall Street Community Center with a community member who is thought to be trusted in the neighborhood. Finally, some surveys that were distributed between March 12th and March 23rd 2018 were collected by a trained community volunteer and forwarded to the team. The distribution of the residences of survey respondents is shown in Figure 4.

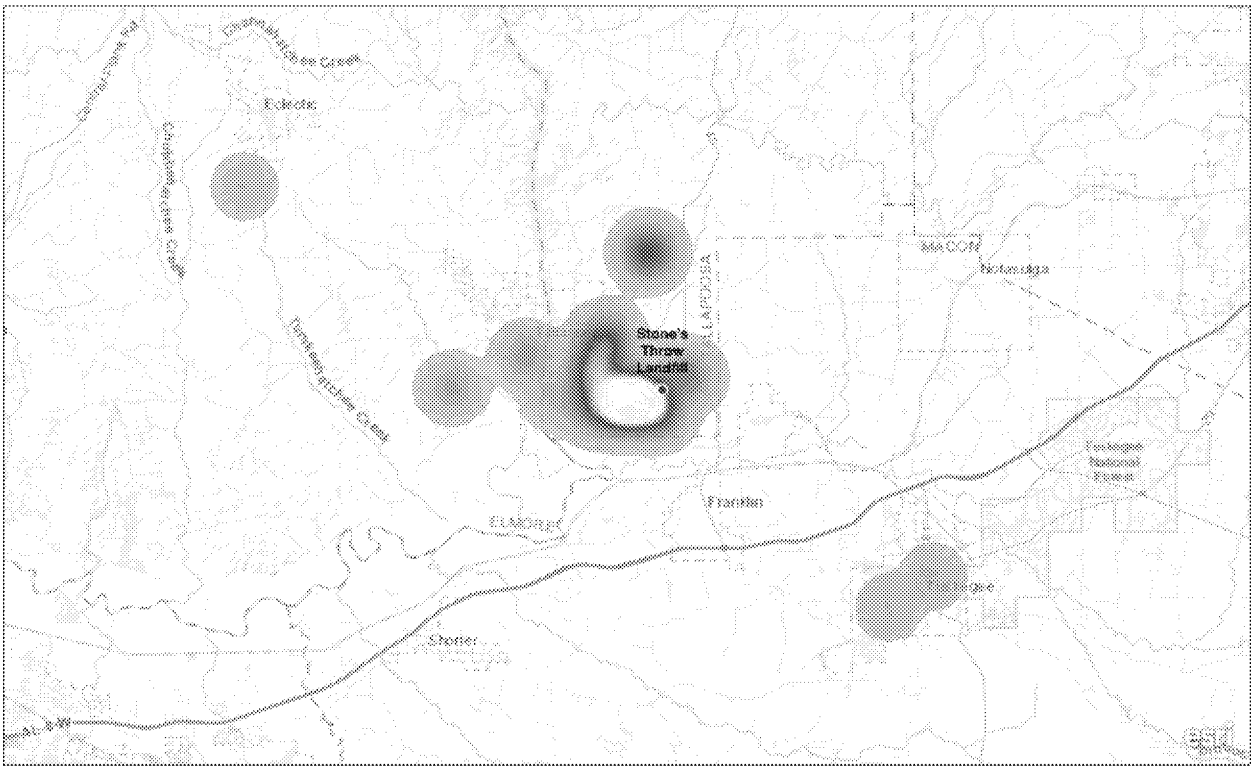

Figure 4. Heat map showing concentration of residential addresses belonging to survey participants in relation to the Stone's Throw Landfill. Yellow represents the highest concentration of residences while blue represents the lowest concentration.

V. Findings & Discussion: Air Monitoring

Hydrogen Sulfide

During the monitoring sessions, H_2S levels ranged from 0 ppb to 5 ppb (Table 7). The highest levels (5 ppb) were observed on March 21st, 2018 at Location D (Sample 7) where the monitor was placed facing the road, 3 meters away, at ground level. At this time, the location was downwind of the landfill. The highest average during a single monitoring period (3.3 ppb) was observed on March 22nd, 2018 also at Location D (Sample 8), with similar monitoring positioning, though the location was *not* downwind from the landfill at this time.

The highest level we observed of 5 ppb is slightly below the lower limit for olfactory effects of 8 ppb, per the Agency for Toxic Substances and Disease Registry. On most days, the monitoring locations were not downwind of the landfill, which may have impacted our results. In the future, we suggest monitoring for H_2S for longer sampling periods in different times of day, weekdays vs. weekends, locations, weather conditions, and seasons (especially in the summer months when the air is warmer and more humid as these characteristics speed up microbial processes and may increase the amount of H_2S detected).

Table 7: H_2S was monitored at six locations between March 12th and March 23rd, 2018. Sample is a unique identifier. Location A-F are the six anonymous locations at which we sampled. Location downwind from landfill (Y or N) indicates whether the sampling location was downwind from the landfill.

H_2S Sample Number	Location	Distance to Landfill (miles)	Duration (hours)	Time of Day	Minimum (ppb)	Maximum (ppb)	Average (ppb)	Location is downwind from the landfill (Y or N)	Wind Speed (mph)	Date (2018)
1	A	1.24	1	14:15 to 15:15	0	1	0.2	N	8.4	Tuesday, 3/20
2	B	0.48	1.5	10:15 to 11:45	2	4	3	n/a	n/a	Thursday, 3/22
3	C	0.87	1.5	18:00 to 19:30	0	4	2	n/a	n/a	Wednesday, 3/21
4	C	0.87	1.5	11:30 to 13:00	0	2	0.4	N	n/a	Tuesday, 3/20
5	D	0.77	6	12:00 to 17:52	0	3	1.8	N	3.2	Tuesday, 3/13
6	D	0.77	1	17:00 to 18:00	0	0	0	N	1.6	Tuesday, 3/20
7	D	0.77	3.5	14:45 to 18:15	0	5	2.4	Y	3	Thursday, 3/22
8	D	0.77	2.25	14:30 to 16:45	2	4	3.3	N	4.8	Thursday, 3/22
9	D	0.77	1.5	9:45 to 11:15	0	3	1.4	N	1.1	Friday, 3/23
10	E	0.32	.5	17:00 to 17:30	2	3	2.5	n/a	n/a	Thursday, 3/22
11	E	0.32	2	7:20 to 9:20	0	3	1.5	N	0	Friday, 3/23
12	F	0.58	1	12:45 to 13:45	2	4	2.6	Y	2	Thursday, 3/22

Non-Methane Volatile Organic Compounds

Table 8 summarizes minimum, maximum, and average total NMVOC values in ppb for the various monitoring periods conducted at five locations. The monitor we used for this data collection, the PID ppbRAE 3000, took measurements every five minutes during monitoring periods. It provided a readout of ppb for total NMVOCs.

NMVOC levels ranged from 0 ppb to 4336 ppb. This highest level of 4336 ppb, as well as the highest average level of 2601 ppb was observed for Sample 10. During the Sample 10 monitoring period (6:37 am to 8:42 am), the monitoring location— which was along the road leading to the landfill— was situated upwind from the landfill. We recorded vehicle counts from 8:20 to 9:20 on this morning, and it is possible that vehicle emissions, especially from diesel trucks, contributed to the ambient NMVOC levels. Twenty-three 18-wheelers,[41] local garbage trucks, and logging trucks were counted, while 14 cars were counted.

For comparison, in 2013, the national annual average NMVOC concentration across Canada was 8.5 ppb (measured as toluene equivalents).[2] As discussed previously, there are no standards for total NMVOCs in ambient air. However, for indoor air, NMVOC concentrations greater than 2200 ppb are considered to be hygienically unacceptable in German schools, with an exposure limit of <1 hour per day for levels 2200-5500 ppb and no permitted exposure for levels >5500 ppb. We observed maximum levels in the 2200-5500 range during 3 separate monitoring sessions (2341, 3770, and 4336 ppb) and we observed average levels in this range during one monitoring session (2601 ppb). Furthermore, NMVOC levels in the 660-2200 ppb range are considered to be hygienically significant, with an exposure limit of 1 month. We observed

maximum NMVOC levels in this range during 5 monitoring sessions and average NMVOC levels in this range during 3 monitoring sessions. For levels greater than 660 ppb, it is recommended that an assessment of individual NMVOC levels be conducted.

Future research should focus on longer sampling periods in different seasons, times of day, weekdays vs. weekends, locations, and weather conditions. To determine the toxicological significance of the NMVOC exposure being experienced by the community, it is crucial that future research assess levels of individual NMVOCs.

Table 8: NMVOCs values collected at six separate locations near Stone's Throw Landfill on six different days between March 12th and March 23rd, 2018. (Y or N) indicates whether the monitoring location was downwind from the landfill.

NMVOC Sample Number	Location	Distance to Landfill (mi)	Duration (hours)	Time of Day	Minimum (ppb)	Maximum (ppb)	Average (ppb)	Location is downwind from the landfill (Y or N)	Wind Speed (mph)	Date (2018)
1	A	1.24	1.25	13:32 to 14:47	0	571	3	N	8.4	Tuesday, 3/20
2	B	0.48	1.9	9:05 to 11:00	0	229	0	n/a	n/a	Thursday, 3/22
3	B	0.48	3.8	9:55 to 13:45	0	1625	42	n/a	n/a	Monday, 3/12
4	C	0.87	1.8	10:15 to 12:05	0	1978	358	N	n/a	Tuesday, 3/20
5	D	0.77	1.25	9:04 to 10:19	0	3770	830	N	1.1	Friday, 3/23
6	D	0.77	5.75	11:18 to 17:03	0	1552	1	N	3.2	Tuesday, 3/13
7	D	0.77	3.5	13:55 to 17:25	0	2341	681	Y	2	Wednesday, 3/21
8	D	0.77	0.16	14:11 to 14:21	0	1432	13	N	4.8	Thursday, 3/22
9	D	0.77	1.25	15:54 to 17:09	0	2119	1141	N	1.6	Tuesday, 3/20
10	E	0.32	1.25	6:37 to 8:42	0	4336	2601	N	0	Friday, 3/23
11	E	0.32	0.08	16:25 to 16:29	0	0	0	n/a	n/a	Thursday, 3/22
12	F	0.58	0.5	12:02 to 12:32	0	124	0	Y	2	Thursday, 3/22

$PM_{2.5}$

$PM_{2.5}$ concentrations ranged from 0 to 58.5 $\mu g/m^3$, with average concentrations ranging from 3.2 to 14.5 ug/m^3 (Table 9). During most of our sampling, the wind direction was blowing towards the landfill (NW to NNW), meaning that the air we sampled had not passed directly over the landfill before reaching our monitors; we do not know whether $PM_{2.5}$ levels are higher when the wind blows directly from the landfill to the community. It should be noted that the diesel truck traffic is part of the landfill operation, so pollution from these trucks are the result of the presence of the landfill.

According to the World Health Organization (WHO) 2005 guideline limits, the maximum exposures of $PM_{2.5}$ is 10 $\mu g/m^3$ annual mean and 25 $\mu g/m^3$ 24-hour mean. The EPA limits are 12 $\mu g/m^3$ annual mean and 35 $\mu g/m^3$ 24-hour mean. Although the highest average concentration we recorded of 14.5 ug/m (over a period of 6 hours) did not exceed the 24-hour limits, we note that because negative health impacts from $PM_{2.5}$ have been observed even at the lowest levels of exposure, the levels observed in the Ashurst Bar/Smith community are a cause for concern.[4]

Future sampling should focus on longer sampling periods (i.e., at least 24-hours) in different seasons, times of day, weekdays vs. weekends, locations and weather conditions (especially dryer weather, warmer temperatures, and wind direction from the landfill to the community).

Table 9: $PM_{2.5}$ values collected at three separate locations[42] near Stone's Throw Landfill on six different days between March 12th and March 23rd, 2018. Location ID is a unique, anonymous identifier for each sampling location. Distance to landfill is the straight-line distance from point A to the center of the cell in the landfill that is currently accepting waste. Min, max, and average are the averages of the min, max, and average of multiple monitors at one location on one day. For instance, when we monitored PM using 3 Purple Air monitors in the same location on the same day, the values from the 3 monitors were averaged together to provide the numbers in the table. Location downwind from landfill (Y or N) indicates whether the sampling location was downwind from the landfill.

PM Sample Number	Location	Distance to Landfill (mi)	Duration (hours)	Time of day	Min ($\mu g/m^3$)	Max ($\mu g/m^3$)	Average ($\mu g/m^3$)	Location downwind from landfill (Y or N)	Wind speed (mph)	Date (2018)
1	B	0.48	5	9:50 to 14:40	0	8.1	5.7	n/a	n/a	Monday, 3/12
2	B	0.48	2	9:40 to 11:50	2.3	9.1	6.1	N	n/a	Thursday, 3/22
3	D	0.77	6	12:00 to 18:00	6.9	58.5	14.5	N	3.2	Tuesday, 3/13
4	D	0.77	1	17:00 to 18:00	3.2	6.6	4.5	N	1.6	Friday, 3/23
5	D	0.77	3	15:20 to 18:30	0	6.3	3.2	N	2	Wednesday, 3/21
6	D	0.77	1	14:20 to 15:30	6.4	21.3	14.2	Y	4.8	Thursday, 3/22
7	D	0.77	4	7:30 to 11:15	1.5	15.8	10.8	N	1.1	Friday, 3/23
8	E	0.32	1.5	15:45 to 17:20	1.7	15.7	10.3	Y	n/a	Thursday, 3/22

Noise

The devices with the NIOSH app were placed near the other pollutant monitors (near roads) and measured in one-or two-hour increments. During monitoring sessions, the highest maximum level of sound observed was 98.1 dBA on March 22nd, 2018 at 2:30 pm at Location D. This was on a quiet day with little wind and we suspect the noise came from large trucks traveling by at fast speeds.[43] The lowest maximum level of sound observed was 76.5 dBA, measured on March 22, 2018. The highest and lowest time-weighted average noise levels were 57.3 dBA and 35.2 dBA (Table 10).

Table 10: Noise data by date and location.

Date	Duration (hours)	Time of Day	Location	Laeq (A-weighted equivalent Sound Level)	Max Level dBA	TWA (Time Weighted Average)	Observations
Wednesday, 3/21	1	15:25 to 16:25	D	63.8	90.5	54.9	Busy truck time, many 18 wheelers and trucks
Wednesday, 3/21	1	16:25 to 17:25	D	59.1	82.8	50.3	Same as above.
Thursday, 3/22	1	10:00 to 11:00	B	45.2	76.5	N/A	Very quiet area, clearly hear beeping and truck dumping in background. Sounds of motors (truck climbing hill maybe or tractors flattening garbage?) and dumping.
Thursday,3/22	1	11:00 to 11:52	B	52.5	86.6	35.2	Same as above.
Thursday, 3/22	2	14:30 to 16:30	D	72.5	98.1	57.3	Not a windy day. Mainly truck traffic noise.
Friday, 3/23	1	7:20 to 8:20	E	57.6	82.4	N/A	Directly across from landfill.
Friday, 3/23	1	8:20 to 9:20	E	58.2	81.3	N/A	Directly across from landfill.
Friday, 3/23	1.33	9:40 to 11:00	D	56.1	84.1	38.0	

It is difficult to contextualize the observed noise measurements given that this landfill is located in a rural residential community and most noise regulations are related to highways and occupational sites (construction, etc.), and not often written as community standards. The Federal Highway Administration describes a "substantial increase in noise level" as noise levels within a

range of 5 to 15 dBA increase over existing noise levels.[44] Further monitoring related to the noise disturbances associated with the landfill and truck traffic may be developed to determine whether there are observable increases compared with ambient or preexisting levels.

We were unable to find a community noise standard for the state of Alabama or for Alabama municipalities. However, Connecticut's Department of Environmental Protection has a Noise Standard,[45] which includes standards for various classes of land and land uses. Class A Lands are defined as: "generally residential areas where human beings sleep or areas where serenity and tranquility are essential to the intended use of the land." This would be most applicable to the homes of people in Tallassee. A landfill would likely be classified as Class C, or "generally industrial where protection against damage to hearing is essential, and the necessity for conversation is limited."

The Connecticut Noise Standards stipulate that:

I. Sound Pressure:

- No person shall cause or allow the emission of impulse noise in excess of 80 dBA peak sound pressure level during the nighttime to any Class A Noise Zone
- No person shall cause or allow the emission of impulse noise in excess of 100 dBA peak sound pressure at any time to any Noise Zone.

II. Noise:

- No person in a Class C Noise Zone (industrial) shall emit noise exceeding 61 dBA (during the day) and 51 dBA (during the night) to adjacent Class A Noise Zones

(residential). Levels emitted above these values shall be considered excessive noise.[46]

If Connecticut's noise standards were applied to Tallassee, Stone's Throw Landfill (a Class C emitter) would be in violation of exceeding the noise levels to the adjacent Class A zone (residential areas) with each daytime maximum noise level (range: 76.5 to 98.1 dBA) greater than the guideline of 61 dBA. Further daytime. monitoring is recommended to determine whether the 100 dBA peak sound pressure guideline is ever surpassed. In addition, nighttime monitoring is recommended to determine whether noise at night near Stone's Throw Landfill exceeds the 80 dB peak sound pressure level limit or the 51dBA night time noise limit.

Traffic and Hourly Car/Truck Counts

As part of the monitoring plan, we conducted hourly vehicle counts with careful attention to how many and what kinds of vehicles are using Washington Boulevard, the narrow county road leading to the landfill. Many community members expressed concerns associated with trucks, including their speed, noise, frequency, and damage to the road due to the ongoing traffic. According to community members, the speed limit on Washington Blvd was previously 20 mph, but was raised to 35 mph.

The highest hourly vehicle count observed was 48 (including fourteen 18-wheeled semi-trucks), on March 21st, 2018 from 3:30 pm to 4:30 pm at Location D (Appendix III). Anecdotally, community members indicated that the highest truck traffic hours are between 5:00 and 7:00 am and between 2:00 and 4:00 pm, which coincides with when children are getting on and off school buses. We observed open-top garbage trucks with construction materials, as well as trucks

regularly crossing the yellow center dividing line, particularly while going around corners. We note that it is possible that frequency of truck traffic might have been impacted by our presence and monitoring activities.

When comparing truck activity with emissions we found a slight increase in $PM_{2.5}$ when trucks were passing by; however, we do not feel the data are conclusive enough to make definitive statements about the effects of truck traffic on air quality. Future monitoring should consider taking careful notes of when trucks are passing and when there are spikes in NMVOCs or $PM_{2.5}$ in order to test for correlations.

Asbestos

According to the Advanced Disposal website,[20] Stone's Throw Landfill accepts friable and non-friable asbestos. Due to the severe impact asbestos can have on human health, we chose to test the ambient air for asbestos. We did not detect asbestos in the ambient air; however, our sampling was limited to one location on one day. Concentrations of asbestos in outdoor and indoor air are inherently variable over time and space and long-term and frequent monitoring should be considered for the future.

Asbestos air concentrations are measured using a pump to draw air through a filter and examining the filter under a microscope to estimate the number of asbestos fibers on the filter. In the future, we suggest monitoring for asbestos on a bi-weekly or monthly basis to establish any trends that may be seasonal or due to particular weather conditions. Monitoring can also be considered within a time period after the landfill has been approved for the receipt of asbestos,

though materials received at the landfill without special permission may also contain asbestos. Asbestos fibers act similar to dust and PM and are most likely to be found in the air on dry days where dust is more likely to moving around. The best time to monitor for asbestos would be during the days or weeks after an asbestos shipment arrives at and is dumped into the landfill, if that could be determined.

Weather Summary

The weather information that we collected revealed fairly consistent trends across monitoring time periods. Over all monitoring time periods and locations, the temperature ranged from 56.2 to 72.9° F. Sky conditions were either sunny with minimal clouds or partly cloudy, except for the afternoon of March 20th, which was fully cloudy. Winds were generally blowing from the NW, NNW, or WNW, except for two monitoring periods during which they were blowing from the SW and WSW (March 21st and the first monitoring period on March 23rd, respectively). Average wind speed across all monitoring periods was 3.1 mph, and the average humidity percentage was 37.5. A complete table of weather data can be found in Appendix II.

VI. Findings & Discussion: Community Health Survey

This section provides a brief summary of the community health survey results. The complete data set is provided in Appendix IV.

Demographic Information

The number of surveys completed and returned was 74. Survey respondents were overwhelmingly African American and low income (Table 11). The average distance between the landfill and residences of survey respondents was 3.78 miles. However, when excluding outliers who live more than 9 miles from the landfill (n=8), this distance drops to an average of 1.97 miles. (These outliers were former residents of the Ashurst Bar/Smith neighborhood and non-resident owners of plots of land in the community who are concerned about the community, may visit regularly, may have moved recently from the community, and attended the community meeting at which 24 surveys were completed. Survey questions did not allow distinguishing which respondents may have lived in the community and moved only recently.) Because we do not have access to census data for the population living within the geographic boundary of the Ashurst Bar/Smith neighborhood of Tallassee, AL, we compiled a collection of census data and estimates from the community members in order to determine of the demographic makeup of the area (Table 11).[30,47] Based on this information, it appears that respondents to the community health survey were a demographically representative sample of the population of the area.

Table 11. Comparison of demographic information from US Census, estimates from community members, and the community health survey.

Demographic Information				
Area Being Measured	**Total Persons**	**Households in Area**	**Percent Below Poverty Level**	**Percent African American**
1-mile radius around Stone's Throw Landfill	117[30]	38[30]	99%[30]	71%[30]
3-mile radius around Stone's Throw Landfill	1,649[30]	612[30]	68.5%[30]	52%[30]
Ashurst Bar/Smith Neighborhood	591[47]	No estimate available	No estimate available	98%
Survey Respondents (average distance of 3.78 miles from landfill)	74 (18 of the participants who completed the survey live within 1 mile of the landfill; 52 live within 3 miles of the landfill)	50 (10 of the households captured by the survey are located within 1 mile of the landfill; 36 are within 3 miles of the landfill)	82%	91%

Perception of Environment

Survey respondents largely reported negative perceptions and attitudes about the landfill and its impacts. When asked to describe the overall impact of the landfill on the community, 78.4% answered "negative." Similarly, 84.9% of survey respondents rated the health of the environment in which they live as unhealthy. This attitude was also evident on the questions gauging concern about the landfill, with most respondents very or extremely concerned about every issue covered

(Table 12). Also striking was the 82.4% of respondents who report avoiding going outside because of poor air quality.

Table 12. Level of concern measured by question 8 on the community health survey.

How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community?						
	Not concerned at all	Not concerned	Concerned	Very concerned	Extremely Concerned	Chose not to respond
Smell	3 (4.5%)	1 (1.3%)	8 (10.8%)	10 (13.5%)	51 (68.9%)	1 (1.3%)
Noise	2 (2.7%)	5 (6.8%)	8 (10.8%)	22 (29.7%)	33 (44.6%)	4 (5.4%)
Animals	0 (0.0%)	5 (6.8%)	8 (10.8%)	15 (20.3%)	43 (58.1%)	3 (4.1%)
Traffic	1 (1.3%)	2 (2.7%)	10 (13.5%)	10 (13.5%)	49 (66.2%)	2 (2.7%)
Air Pollution	2 (2.7%)	2 (2.7%)	3 (4.5%)	6 (8.1%)	60 (81.0%)	1 (1.3%)
Decrease in Property Value	0 (0.0%)	2 (2.7%)	6 (8.1%)	13 (17.6%)	51 (68.9%)	2 (2.7%)
Litter	1 (1.3%)	3 (4.5%)	6 (8.1%)	15 (20.2%)	48 (64.9%)	1 (1.3%)
Health Impacts	0 (0.0%)	2 (2.7%)	5 (6.8%)	7 (9.5%)	58 (78.4%)	2 (2.7%)

Health

Survey respondents reported a high prevalence of asthma and chronic obstructive pulmonary disease (COPD) compared with the population of Alabama (Figure 5). In total, 29.2% reported

being told by a doctor that they have asthma, almost double the statewide prevalence in Alabama measured by the 2015 Behavioral Risk Factor Surveillance System (BRFSS)[48] (15.6%). 20.8% of survey respondents reported being told by a doctor they have COPD, chronic bronchitis, or emphysema, again almost double the statewide prevalence of 10.5%.

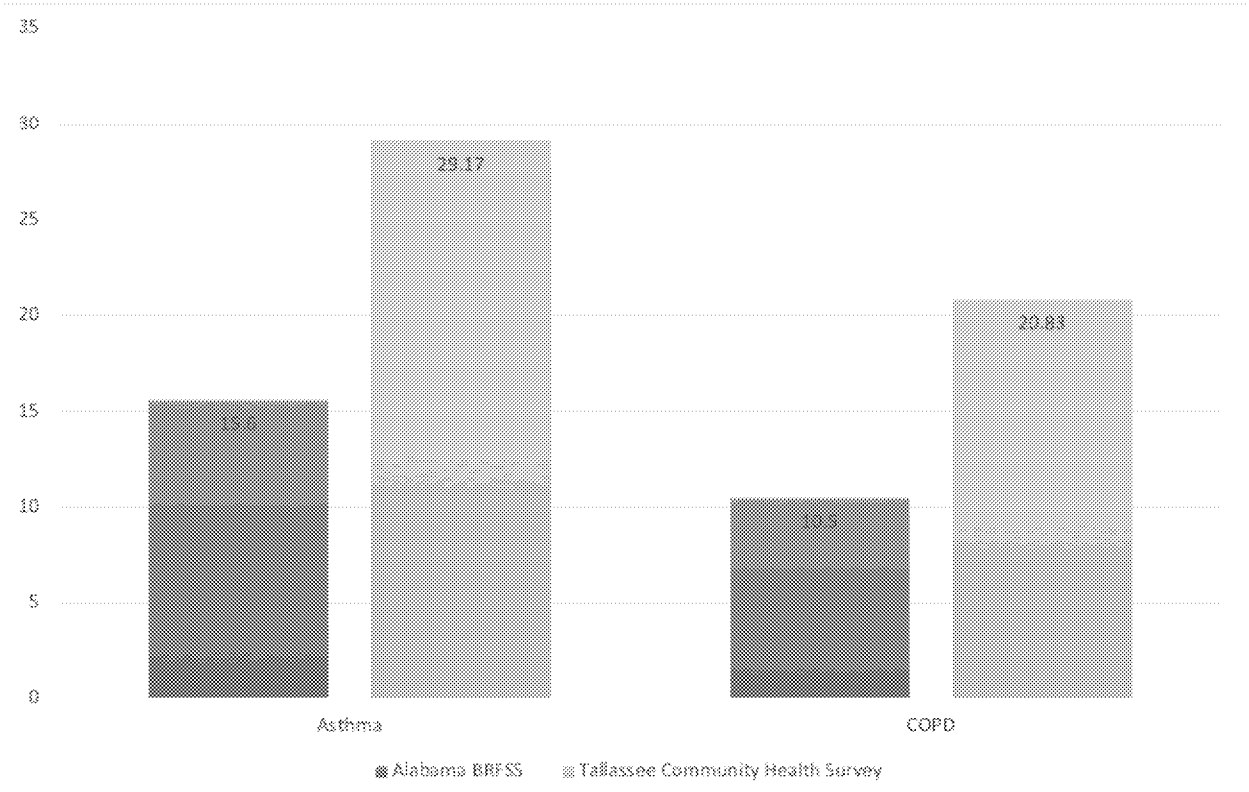

Figure 5. Comparison of asthma and COPD prevalence measured by the community health survey with statewide prevalence reported by the Alabama BRFSS Survey.

Limitations

The main limitation was the relatively small sample size (n=74), which hampered our statistical power and our ability to assess the relationship between health conditions and relevant factors such as distance of residence from landfill and to control for potential confounders, such as workplace exposures, socioeconomic status, education level, and lifestyle.

Additionally, survey results could be influenced by our recruitment methods. Twenty-four of the 74 surveys were collected at a community meeting organized by members of the community who are concerned about the impact of the landfill. By attending the meeting and demonstrating concern, the sample has self-selected. However, it is significant that such a large proportion of the community attended the community meeting. As mentioned, eight of the attendees of this meeting who completed surveys are not currently residents of the Ashurst Bar/Smith neighborhood, but rather former residents of the Ashurst Bar/Smith neighborhood or non-resident inheritors of plots of land in the community. These participants live 9 to 24 miles from the Stone's Throw Landfill, and skewed the average distance to the landfill. While their current exposure may be different than full-time residents of the community, their responses may still be relevant and as a result their responses were included in the final data set.

VII. Next Steps

In this section we outline recommendations for consideration by the Ashurst Bar/Smith Community as well as the universities involved in this study. In general, the research presented in this pilot study is highly preliminary and limited. However, we were able to identify some key warning signs, including hydrogen sulfide levels approaching the odor threshold, high non-methane volatile organic compound (NMVOC) levels of unknown composition, transient elevated $PM_{2.5}$ levels, high noise levels in relation to community standards, high prevalence rates of asthma and COPD, and, importantly, high levels of concern in the community about smell, noise, traffic, air pollution, health impacts, property values, animals, and litter. The following next steps could be taken to build upon and improve this research.

Expand Upon Pilot Air Monitoring

Further air monitoring for H_2S, NMVOCs, $PM_{2.5}$, and asbestos is clearly indicated. In general, we suggest that air quality monitoring should be performed for longer periods of time at various locations both daily and annually because air quality can change dramatically according to time of day, day of week (weekdays versus weekends), season, landfill activity, and weather conditions. In addition, it is particularly important to monitor at locations downwind of the landfill, which was difficult to do with our limited amount of time and knowledge of the community. We suggest prioritizing future planning and research through collaborative partnerships with the Yale School of Public Health, the Department of Graduate Public Health at Tuskegee University, and Ashurst Bar/Smith community members, using a community-based participatory research approach if favored by the community. Furthermore, we suggest that the community consider seeking support form ADEM, the landfill, the City of Tallassee, or the county, for monitoring efforts.

Hydrogen Sulfide Sampling Recommendations

H_2S is known to cause serious health issues and smells like rotten eggs. In one study, odor was strongly associated with alteration of daily activities, negative mood states, mucosal irritation, and upper respiratory symptoms.[8] Because odor is a common complaint from the community members, we suggest monitoring in summer months when temperature and humidity are high, as well as when odors are particularly potent. Emissions are likely to change significantly throughout the day due to changes in temperature and humidity and we suggest prioritizing monitoring in the early morning (5am to 11am) and late evening (4pm to 10pm).

NMVOC Sampling Recommendations

To better understand which NMVOCs are present in the ambient air near the Stone's Throw Landfill, as well as their potential health effects, future research could assess individual NMVOCs, with a focus on HAPs and NMVOCs that are specifically associated with landfills. Benzene and vinyl chloride are HAPs that are commonly emitted from landfills and are known for causing health issues. Information on the levels of these individual compounds could provide a more nuanced picture of the health risks that the landfill poses to the community. Linkages could be made between the waste that the landfill accepts and the levels of these and other specific HAPs and NMVOCs. Finally, an effort should be made to determine how much of the NMVOC pollution is from landfill-associated vehicle traffic.

Particulate Matter, Noise, and Truck Traffic Recommendations

For community members who are interested in continuing air pollution monitoring to gather more data, we see the greatest opportunities in monitoring particulate matter and noise, due to the low cost and technical accessibility of the monitoring devices: Purple Air Monitor for $PM_{2.5}$ (approximately $250) and the NIOSH Noise App (available free for download on iPhones).

As mentioned, future sampling for $PM_{2.5}$ should focus on longer sampling periods (i.e., at least 24-hours), under a wide variety of weather conditions (especially dryer weather, warmer temperatures, and wind direction from the landfill to the community). We also suggest taking detailed notes on any potential PM sources near the sampling location such as open fires, diesel truck traffic, or disturbance to dry soils as these sources may influence air monitoring results. If resources can be made available, we suggest monitoring for PM_{10} in addition to $PM_{2.5}$ because

these two types of PM can be created by different activities and may provide important information about what is causing PM to be in the ambient air.

For noise sampling, we recommend engaging community members willing to carry out sampling for a prolonged period of time, in order to gather sufficient data points to strengthen findings. Given the need to use a smartphone to run the NIOSH app, this type of monitoring might be suitable for local teenagers who are "tech-savvy." We also recommend potentially engaging local high schools and teachers to design and enhance the quality of the study as part of a science curriculum. Also feasible would be truck traffic counts by community members to provide additional information on the impacts of the landfill on quality of life and health, as well as provide data on the potential correlation between truck traffic and emissions.

Asbestos Sampling Recommendations

Our sampling of asbestos was very limited and the fact that we did not detect asbestos in our one sample does not show there is no asbestos exposure in the community, given that the landfill is permitted to accept asbestos waste. Future asbestos monitoring should be done over an extended period of time to determine whether or not exposure occurs due to the presence of asbestos in the landfill. Asbestos monitoring equipment consists of a high-volume pump, plastic tubing, and phase contrast microscopy (PCM) filters. A set can be purchased for $200 to $500 from an environmental equipment supplier.[49] We suggest using the following resources to design and implement an asbestos monitoring program:

- EPA— "Asbestos Sampling" :https://archive.epa.gov/region9/toxic/web/pdf/epa-ert-asbestos-sampling-sop-2015.pdf

- EPA — "Summary of Outdoor Ambient Air Monitoring For Asbestos at the Libby Asbestos Site:" https://www.epa.gov/sites/production/files/documents/AmbientAirReportFinal09Feb2009.pdf
- OSHA - "Detailed Procedures for Asbestos Sampling and Analysis:" https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9997

Additional Monitoring

In addition to expanded monitoring of air quality and landfill-related activities such as truck traffic, we suggest developing a more comprehensive pollution monitoring plan that takes into account other modes of landfill pollution as well as possible sources of pollutants other than those emitted directly by the landfill (e.g. unpaved roads, mold in houses, outdoor/indoor air exchange, burning of trash and firewood, traffic). A strategy moving forward could include:

1. Water Testing: Runoff from the landfill could potentially contaminate local streams and drinking water. Due to the rural nature of the Ashurst Bar/Smith community, many residents own property that was historically used for agriculture, raising animals, or home gardening. Water sources may be impacted by the landfill. Ashurst Bar/Smith Community Organization and the Department of Graduate Public Health at Tuskegee University have faced resource and technological limitations in implementing water sample testing. We recommend further collaboration across stakeholder groups to determine next steps in researching drinking water quality and interpreting results. Additionally, non-potable water sources should be tested.
2. Soil Testing: Tuskegee University researchers recently received approval to proceed with soil sampling at one site, which may reveal pollutants associated with the landfill as well as other pollutants that may be impacting community health. It is important to understand if the soil is contaminated, given that food is grown in soil and children may ingest soil

directly. We recommend further cross-stakeholder collaboration to determine next steps for additional soil sampling or remediation.

3. Indoor air quality monitoring: As a result of poor air quality in the area surrounding Stone's Throw Landfill, members of the community now spend most of their time indoors in an effort to avoid exposure to polluted air. Indoor air quality data are therefore useful for evaluating exposure to harmful pollutants, as well as risks of explosions. Indoor air quality may be especially compromised in the Ashurst Bar/Smith Community, if emissions from the landfill are lingering in homes. When monitoring indoor air quality, emissions from household products such as a gas stove or hairspray also need to be taken into account. Incorporating indoor air quality monitoring into the monitoring plan would require an extensive amount of research into indoor air monitoring equipment and the common types of pollutants that linger in homes.

Community Health Surveys

The elevated prevalence of asthma and COPD, although based on a relatively small sample size, are of obvious concern. Collecting more information about the status of the health of the community is a necessary step moving forward. This information is important for all stakeholders in understanding the impacts of the landfill on health. One approach would be to increase the participation rate for the survey used for this report by working to add respondents. Additional research might include a survey of a nearby comparison community that is not exposed to the landfill. Community leaders could also collect additional qualitative data by distributing personal diaries for community members to track daily activities, mood states, and irritant and other physical symptoms, similar to the Heaney et al. study.[8] Finally, because

community members have expressed concerns about a high incidence of cancer and birth defects, epidemiological studies of these health outcomes should be considered.

Other Actions

Ashurst Bar/Smith Community members are already engaged in advocacy, particularly around the permitting of the landfill. The following recommendations might inform additional steps to mitigate effects of landfill operations and related activities.

1. Community representatives or researchers should consider requesting that ADEM and/or the Stone's Throw landfill publicly release emissions history data as well as information about landfill contents. For example, it is unclear whether the landfill monitors H_2S, despite this chemical being a common landfill emission with known human health impacts.
2. Community representatives should consider requesting that the landfill or government agencies provide resources for offsite air, soil, dust, and water monitoring.
3. Community representatives should consider proposing policies on the city, county or state level that might mitigate impacts, including the following:
    a. A community noise ordinance for Tallassee, which could be modeled after the CT standards discussed in Section VI.
    b. Improved enforcement of landfill permit terms, such as enforcement of hours of operation and ensuring adequate cover of any open face of the landfill.
    c. More stringent landfill policies including i) requiring that any open face of the landfill be covered at night; ii) withdrawal of the current permit variance that allows the landfill to have two simultaneous open faces; and iii) requirement that

the landfill clean up trash from the sides of the road, particularly along Washington Boulevard

d. Improvements in traffic safety (e.g.: traffic lights, lower speed limits, speed bumps, restricted hours for trucks, a dedicated private road for landfill truck traffic) and resources for community-based traffic monitoring efforts
e. Increased buffers and/or restrictions in any future expansion of size of the landfill.

4. The daily traffic volume of landfill vehicles may continue to increase as the size of the landfill increases. We suggest designing a traffic monitoring plan that measures speed of trucks with speed cameras and summarizes characteristics of the roads used by these landfill vehicles including width and curvature. This information could inform local authorities and legislators on the negative impacts of the increased truck traffic through the community.
5. Findings of the health survey merit further study, including the possibility of testing and monitoring of health status, as well as efforts to ensure that all community members have access to comprehensive health care. Public health involvement is a necessary precursor to any testing and monitoring program and development of health care services. Given the particular history of this community, it would be imperative that any study start with community involvement, informed consent, and adherence to ethical standards, more generally.

Community Recommendations

The following interim strategies are available to reduce the negative impact of the landfill on health. We acknowledge that many community members believe that the most effective public health protective measure would be for the landfill to close, and that eliminating emissions is a

better preventive strategy than the suggestions in this section. We also appreciate that some options may not be feasible for community members. Where costs are a barrier, the Ashurst Bar/Smith Community Organization might propose that these costs by covered by the landfill or governmental agencies. Because the future of the landfill remains unresolved, we are providing a sample of steps that could be taken by individuals in the community to mitigate negative health impacts.

Improve Home Air Quality with Air Filtration Devices

Home air quality improvement strategies and products can range in price and efficacy and may be cost prohibitive for many community members. However, we feel that it is important at least to offer potential strategies that can be explored for short-term, personal mitigation, and community members may seek to have the landfill or government agencies provide these products. We see these strategies as not only able to mitigate potential toxic emissions from the landfill that may be entering homes, but also to eliminate other potential sources of indoor air pollution that are common to indoor home environments and may be adding to community members' total pollutant exposure. These pollution sources include cleaning and pest control products, household dust, consumer products, building materials, and furnishings.

Air filtration devices could be used in homes in the community to improve indoor air quality. We note that the New Zion A.M.E. Zion Church has already installed air filters, and recommend that in the future the community consider requesting that Advanced Disposal or ADEM provide these devices. Alternatively, air filter manufacturers may be receptive to providing free or reduced-cost filters, given the air quality conditions in the community. Finally, the community could fundraise

to purchase air filters, or purchase them individually, if possible. The following are two options for filters:.

1. HVAC System Filters
    - Look for MERV (Minimum Efficiency Reporting Value), a measure of efficiency for filters installed in HVAC systems. Ratings range from 1 to 20. According to the EPA, filters with a MERV rating between 7 and 13 are likely to be nearly as effective as true HEPA filters at controlling most airborne indoor particles. A pack of two MERV 13 filters costs approximately $50.
    - High Efficiency Particulate Air (HEPA) Filters mechanically remove particles from the air. They have a MERV Value of 17-20. HEPA air filters for HVAC systems cost between $100-$200.
2. Portable Air Cleaners can be moved from room to room. Effectiveness is measured by the clean air delivery rate (CADR). Portable air purifiers range from $100 to $800, though the effectiveness of lower cost models is questionable. Portable air purifiers with a high CADR rate (300+) currently for sale in the United States include:
    - Whirlpool AP45030K - $209
    - Kenmore 85264 - $219
    - Whirlpool AP51030K - $230-$349
    - Blueair 650E - $569
    - Blueair 503 - $659
    - Blueair 603 - $769

For more information, see:

1. USEPA's *Guide to Air Cleaners in the Home*, available at: https://www.epa.gov/indoor-air-quality-iaq/guide-air-cleaners-home-printable-version
2. EWG's *Healthy Living: Home Guide - Air Filters*, available at: https://www.ewg.org/healthyhomeguide/air-filters/#.WuCKzdPwZE5

Safe Cleaning and Purchasing Tips

1. Vacuum carpets and soft furniture often to control dust and other pollutants.
2. Use non-toxic safe cleaning products. Look for EPA's "Safer Choice" label (shown to the right) on cleaning products. These products are certified by EPA scientists to be safer for human health and the environment.
3. Choose low-NMVOC toys, paint, and furniture. Though there is no government certification label for products meeting this standard, consider purchasing products such as Green Seal-11 certified paint.
4. For more information, see Environmental Working Group's (EWG) *Top Tips for Better Air Quality*, available at: https://static.ewg.org/ewg-tip-sheets/EWG-AirQualityTips.pdf?_ga=2.81535895.1687753434.1524663873-538422630.1524663873

Limit Outdoor Exposure at Certain Times

We advise that, as already practiced by many community members, individuals avoid spending extensive amounts of time outside during periods of increased traffic, during extreme heat, and when smells are particularly noticeable— or if an individual is experiencing extreme dizziness and headaches. We recognize that this practice is already in place for many households and places a significant burden on lifestyle; thus, we recommend that individuals continue to use their best judgement and discretion to decide what is most appropriate for their wellbeing, especially in light of the general benefits of outdoor recreation and play, particularly for children. Further research efforts may be able to illuminate more specific and scientifically-backed recommendations about specific times to stay indoors.

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Acknowledgements

We would like to give a special thank you to all of the collaborators on this project including Robert Dubrow, Marianne Engelman-Lado, Yume Hoshijima, Katherine Wolf, John Heath, Crystal James, Ronald Smith, and the Ashurst Bar/Smith community. We would also like to thank the extended network of air quality monitoring professionals whose advice was instrumental to our success throughout the process. We hope this report will inform future actions to prevent the Stone's Throw Landfill from negatively impacting the Ashurst Bar/Smith community.

Appendices

I. Tallassee/ the Ashurst Bar/Smith Community Organization (ABSCO) Timeline

Prepared by the Yale Environmental Justice Clinic, 2-12-2018

1980-1986	Landfill was a privately owned and operated 30-acre facility.
1986	Landfill was sold to Waste Away, Inc. The Landfill, at this time, serviced an 18-county area.
June 10, 1991	First host agreement between Tallapoosa County and Tallassee Waste Disposal Center, Inc. is signed. This approves an expansion of the Landfill. Subsequently, citizens organize and request a hearing.
September 1991	Citizens express concerns to a Waste Away representative about the Landfill. They are given a verbal agreement for improvements, which was not fulfilled.
April 1992	Waste Away seeks to purchase more landfill for expansion.
Around 1993	ADEM and Tallapoosa County release a range of studies about the Landfill.
September 1993	Landfill closes, partly due to federal regulations, wetland problems, and Waste Away's inability to buy additional land.
September 1999	TCC approves a proposal to reopen the Landfill. ABSCO is reestablished, and a Steering Committee is formed.
November 15, 1999	Host agreement renewed.
December 17, 1999	ABSCO joins a Title VI complaint against ADEM filed by the Center for Race, Poverty & the Environment.
August 2000	ABSCO conducts water testing in the area.
October 2001	ADEM grants the Landfill's permit – the facility is now operated by Sunflower Waste.
August 22, 2002	The Landfill receives a wetland fill permit from the Army Corps.
June 2003	"Yerkwood Report" is released, in which EPA recommends that ADEM improve its civil rights-related practices.

June 13, 2003	ADEM releases a public notice for a proposal to fill 7.46 acres of wetlands in recently purchased land tracts.
August 26, 2003	ADEM holds a public hearing regarding the proposed modification of the Landfill's permit
September 3, 2003	Ex. 6 Personal Privacy (PP) files Title VI complaint with EPA on behalf of ABSCO.
September 30, 2003	EPA confirms receipt of ABSCO complaint
December 8, 2003	Ex. 6 Personal Privacy (PP) sends a more formal and detailed Title VI complaint to EPA.
February 8, 2005	Ex. 6 Personal Privacy (PP) files Title VI complaint with EPA against the Mobile District of the Army Corps of Engineers and ADEM.
September 7, 2005	EPA accepts Ex. 6 Personal Privacy (PP) September 2003 Title VI complaint.
December 6, 2005	EPA rejects Ex. 6 Personal Privacy (PP) February 2005 Title VI complaint on the basis that the Army Corps has withdrawn its permit application.
October 12, 2006	In an e-mail to David Ludder, EPA claims that it is investigating [redacted] Ex. 6 Personal Privacy (PP) September 2003 Title VI complaint.
January 25, 2013	EPA partially dismisses the intentional discrimination prong of [redacted] Ex. 6 Personal Privacy (PP) September 2003 Title VI complaint.
August 2016	The ADEM director said—at an ADEM commissioners' meeting—that ADEM had no responsibility to comply with Title VI.
November 2016	Ex. 6 Personal Privacy (PP), and others submit comments to oppose the renewal of the Landfill's permit from 2017-2022.
February 22, 2017	ADEM renews the Landfill's permit until 2022.
April 28, 2017	EPA closes Ex. 6 Personal Privacy (PP) September 2003 Title VI complaint. ABSCO files another complaint to challenge the 2017-2022 renewal of the Landfill's permit.

II. Weather Data

Location	Time of Recording	Wind Direction	Wind Speed (mph)	Headwind	Crosswind	Humidity (%)	Temp (F)	Barometric Pressure (Hg)	Altitude (ft)	Conditions	Date
D	12:42	NNW	3	1.9	0.8	33.1	60.1	29.7	195	clear, sunny, minimal clouds	3/13/2018
D	13:42	NW	3	2.2	1.1	26.5	61.8	29.64	195	clear, sunny, minimal clouds	3/13/2018
D	14:45	NW	3	1.1 @ 008	0	21.1	64.6	n/a	195	clear, sunny, minimal clouds	3/13/2018
D	16:00	NNW	4	2.5 @ 332	4	25.9	60.4	n/a	195	clear, sunny, minimal clouds	3/13/2018
D	17:25	NNW	3	1.6 @ 334	1.4	27.2	61.8	n/a	195	clear, sunny, minimal clouds	3/13/2018
C	11:00	NNW	n/a	n/a	n/a	58.8	66.2	29.23	638	clear, sunny, minimal clouds	3/20/2018
A	14:20	NNW	8.4	3	0	43.6	73	29.28	583	clear, sunny, minimal clouds	3/20/2018
D	17:45	WNW	1.6	0.8	1.4	60	56.6	29.26	608	cloudy	3/20/2018
D	15:35	SW	3	0	0	37	72.9	29.57	315	partly cloudy	3/21/2018
F	13:20	NW	2	3	3.1	30.1	60.7	29.85	53	clear, sunny, very few clouds	3/22/2018
D	14:30	NW	4.8	5	1.6	30	63	29.81	88	clear, sunny, very few clouds	3/22/2018
E	7:20	WSW	0	0	0	52.6	43	29.86	48	partly cloudy	3/23/2018
D	9:50	NW	1.1	1.6	1.5	41.1	56.2	29.9	15	partly cloudy	3/23/2018

III. Traffic and Hourly Car/Truck Counts Data

Start Time	End Time	Location	18 Wheelers	Local Garbage Trucks	Open Top Garbage Trucks	Logging Trucks	Cars	Misc.	Total
13:15	14:15	D	7	5	2	1	5	2	22
14:15	15:15	D	14	3	5	2	9	4	37
15:15	16:15	D	8	6	1	0	20	5	40
16:15	17:15	D	6	1	0	0	9	2	18
14:15	15:15	A	0	1	0	0	24	5	30
15:15	15:40	A	0	0	0	0	13	2	15
15:35	16:35	D	14	9	0	0	20	5	48
16:40	17:40	D	3	0	0	0	28	1	32
14:30	15:30	D	8	3	4		9	8	32
15:30	16:30	D	10	9	2		6	5	32
7:20	8:20	E	8	4	2		10		24
8:20	9:20	E	10	4	8		14	1	37

IV. Community Health Survey Responses

Q1. Participant ID Number			
Q2. How many people live in your household, including you?			
	Answer	%	Count
	0	1.39	1
	1	16.67	12
	2	29.17	21
	3	13.89	10
	4	15.28	11
	5	16.67	12
	6	2.78	2
	7	2.78	2
	8	1.39	1
	Missing		2
Q3. How many people living in your household are under the age of 18?			
	Answer	%	Count
	0	55.88	38
	1	14.71	10
	2	13.24	9
	3	8.82	6
	4	4.41	3
	5	1.47	1
	25	1.47	1

	Missing		6
Q4. How long have you lived in Tallassee? (If you have moved away from the area and returned, please answer for total amount of time lived in Tallassee over the course of your life.)			
	Answer	%	Count
	3	3.08	2
	6	1.54	1
	7	1.54	1
	8	1.54	1
	10	3.08	2
	12	1.54	1
	15	4.62	3
	18	1.54	1
	17	3.08	2
	20	1.54	1
	21	1.54	1
	22	1.54	1
	24	1.54	1
	25	6.15	4
	26	1.54	1
	27	3.08	2
	29	1.54	1
	30	3.08	2
	35	3.08	2
	36	4.62	3
	39	1.54	1
	40	1.54	1

	43	1.54	1
	44	1.54	1
	45	4.62	3
	46	1.54	1
	47	1.54	1
	48	1.54	1
	50	3.08	2
	54	1.54	1
	55	1.54	1
	59	3.08	2
	60	4.62	3
	63	3.08	2
	67	1.54	1
	68	3.08	2
	69	1.54	1
	75	1.54	1
	81	1.54	1
	83	1.54	1
	88	3.08	2
	Missing		9
Q5. About how close do you live to the Stone's Throw Landfill?			
	Answer	%	Count
	Very close (within 1,000 feet, which is about a quarter of a mile)	13.51	10
	Close (within 2,500	5.41	4

	feet, which is about a half mile)		
	Within a mile	32.43	24
	Over 1 mile	37.84	28
	Not sure	10.81	8
	Missing		0
Q6. How often do garbage trucks traveling to or from the Stone's Throw Landfill pass your residence?			
	Answer	%	Count
	Multiple times a day	55.71	39
	Once a day	2.86	2
	Several times a week	18.57	13
	Once a week	20.00	14
	Never	2.86	2
	Missing		4
Q7. How would you describe the overall impact of the Stone's Throw Landfill on your community?			
	Answer	%	Count
	Positive	9.54	7
	Negative	79.45	58
	Not sure	10.96	8
	Missing		1
Q8.1 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Smell coming from the landfill			
	Answer	%	Count
	Extremely concerned	69.86	51

	Very concerned	13.70	10
	Concerned	10.96	8
	Not concerned	1.37	1
	Not concerned at all	4.11	3
	Missing		1
Q8.2 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Noise created by the landfill			
	Answer	%	Count
	Extremely concerned	47.14	33
	Very concerned	31.43	22
	Concerned	11.43	8
	Not concerned	7.14	5
	Not concerned at all	2.86	2
	Missing		4
Q8.3 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Animals drawn to the area by the landfill			
	Answer	%	Count
	Extremely concerned	60.56	43
	Very concerned	7.04	5
	Concerned	11.27	8
	Not concerned	7.04	5
	Not concerned at all	0.0	0
	Missing		3
Q8.4 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Traffic traveling to and from the landfill			

	Answer	%	Count
	Extremely concerned	68.06	49
	Very concerned	13.89	10
	Concerned	13.89	10
	Not concerned	0.0	0
	Not concerned at all	1.39	1
	Missing		2
Q8.5 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Air pollution			
	Answer	%	Count
	Extremely concerned	82.19	60
	Very concerned	8.22	6
	Concerned	4.11	3
	Not concerned	2.74	2
	Not concerned at all	2.74	2
	Missing		1
Q8.6 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? A decrease in property value since the creation of the landfill			
	Answer	%	Count
	Extremely concerned	70.83	51
	Very concerned	18.06	13
	Concerned	8.33	6
	Not concerned	2.78	2
	Not concerned at all	0.00	0

	Missing		2
Q8.7 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Litter falling out of garbage trucks traveling to the landfill			
	Answer	%	Count
	Extremely concerned	65.75	48
	Very concerned	22.55	15
	Concerned	8.22	6
	Not concerned	4.11	3
	Not concerned at all	1.37	1
	Missing		1
Q8.8 How concerned are you about each of the following issues relating to the Stone's Throw Landfill and its impact on your community? Adverse health effects caused by exposure to the landfill			
	Answer	%	Count
	Extremely concerned	80.56	58
	Very concerned	9.72	7
	Concerned	8.22	6
	Not concerned	2.78	2
	Not concerned at all	0.0	0
	Missing		2
Q9. Do you ever avoid going outside because of poor air quality?			
	Answer	%	Count
	Yes	84.72	61
	No	12.50	9

	Not sure	2.78	2
	Missing		2
Q10. How would you rate the health of the environment in which you live?			
	Answer	%	Count
	Very healthy	0.0	0
	Healthy	2.74	2
	Somewhat healthy	12.33	9
	Unhealthy	38.36	28
	Very unhealthy	46.58	34
	Missing		1
Q11. How would you rate your personal health?			
	Answer	%	Count
	Very healthy	6.76	5
	Healthy	18.92	14
	Somewhat healthy	31.08	23
	Unhealthy	36.49	27
	Very unhealthy	6.76	5
	Missing		0
Q12. How do you pay for health care?			
	Answer	%	Count
	Pay cash (no health insurance)	10.81	8
	Private health insurance (e.g. insurance provided	29.73	22

	through your employer or spouse's employer)		
	Medicaid	16.22	12
	Medicare	28.38	21
	Veterans Administration (VA)	4.05	3
	Indian Health Service	0.0	0
	Other	6.76	5
	I prefer not to answer	4.05	3
	Missing	0.0	0
Q13. What hospital do you go to most of the time?			
	Answer	%	Count
	Community Hospital, Tallassee AL		45
	Elmore Community Hospital, Wetumpka AL		1
	VA Medical Center, Tuskegee AL		2
	VA Medical Center, Montgomery AL		2
	Baptist Medical Center, Montgomery AL		15
	Lake Martin Community Hospital, Dadeville AL		0
	Jackson Hospital, Montgomery AL		4
	Prattville Baptist Hospital, Prattville AL		0
	Bullock County		0

	Hospital, Union Springs AL		
	East Alabama Medical Center, Opelika AL		13
	Russell medical, Alexander City AL		1
	Other		7
	Prefer not to answer		0
	Missing		1
Q14. Has a doctor, nurse, or other health professional ever told you that you that you have asthma?			
	Answer	%	Count
	Yes	29.17	21
	No	68.06	49
	Prefer not to answer	2.78	2
	Missing		2
Q15. If yes, at what age were you diagnosed?			
Q16. Has a doctor, nurse, or other health professional ever told you that you that you have chronic obstructive pulmonary disease (COPD), chronic bronchitis, or emphysema?			
	Answer	%	Count
	Yes	20.83	15
	No	73.61	53
	Prefer not to answer	5.56	4
	Missing		2

Q17. If yes, at what age were you diagnosed?			
Q18. Has a doctor, nurse, or other health professional ever told you that you that you have cancer?			
	Answer	%	Count
	Yes	6.85	5
	No	90.41	66
	Prefer not to answer	2.74	2
	Missing		1
Q19. If yes, what type of cancer were you diagnosed with?			
Q20. How many biological children do you have?			
	Answer	%	Count
	0	23.44	15
	1	12.50	8
	2	17.19	11
	3	25.00	16
	4	10.94	7
	5	4.69	3
	6	4.69	3
	7	1.56	1
	Missing		10
Q21. Has a doctor, nurse, or other health professional ever told you had a miscarriage?			
	Answer	%	Count

	Yes	11.43	8
	No	70.00	49
	Prefer not to answer	1.43	1
	Missing		4
Q22. If yes, how many miscarriages have you experienced?			
	Answer	%	Count
	1		6
	Missing		68
Q23. Has a doctor, nurse, or other health professional ever told you that your child was born with a birth defect?			
	Answer	%	Count
	Yes	8.22	6
	No	75.34	55
	Prefer not to answer	2.74	2
	Missing		1
Q24. If yes, were you living in the Ashurst Bar/Smith Community when the child was born?			
Q25. Has a doctor, nurse, or other health professional ever told you that a child (under the age of 18) living in your household has asthma?			
	Answer	%	Count
	Yes	25.35	18
	No	63.38	45
	I do not have children living in my household	11.27	8
	Missing		3

Q26. If yes, how many children (under the age of 18) living in your household have been diagnosed with asthma?			
	Answer	%	Count
	1	81.25	13
	2	12.50	2
	3	6.25	1
	Missing		58
Q27. Do you smoke?			
	Answer	%	Count
	Yes, I smoke regularly	7.04	5
	No, but I smoked regularly in the past	19.72	14
	No, I have never been a smoker	69.01	49
	I prefer not to answer	4.23	3
	Missing		3
Q28. Please check all symptoms that YOU have experienced in the past month.			
Q29. Has a member of your household died in the past 5 years?			
	Answer	%	Count
	Yes	16.18	11
	No	82.35	56
	Prefer not to answer	1.47	1
	Missing		6

Q30. If yes, what was their cause of death?			
Q31. What is your gender?			
	Answer	%	Count
	Female	66.67	46
	Male	33.33	23
	Prefer not to answer		5
Q32. What is your age?			
	Answer	%	Count
	25 or younger	10.96	8
	26-39	17.81	13
	40-54	21.92	16
	55-64	20.55	15
	65 and over	27.40	20
	Prefer not to answer	1.37	1
	Missing		1
Q33. What is your annual household income? The combined income of all wage earners in your household.			
	Answer	%	Count
	Less than $20,000	39.44	28
	$20,000-$29,000	9.89	7
	$30,000-$39,000	11.27	8
	$40,000-$49,000	1.41	1

	$50,000 or above	18.31	13
	Prefer not to answer	19.72	14
Q34. What ethnicity do you most identify yourself as?			
	Answer	%	Count
	African American/Black	90.41	66
	Asian/Pacific Islander	0.0	0
	Hispanic/Latino	0.0	0
	Native American	0.0	0
	White/Caucasian	8.22	6
	Mixed	1.37	1
	Other	0.0	0
	Prefer not to answer	0.0	0
	Missing		1
Q35. Are there any additional comments that you would like to provide?			